

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-157858

(43)Date of publication of application : 31.05.2002

(51)Int.Cl.

G11B 25/04
G11B 33/08

(21)Application number : 2000-353021

(71)Applicant : HITACHI LTD

(22)Date of filing : 20.11.2000

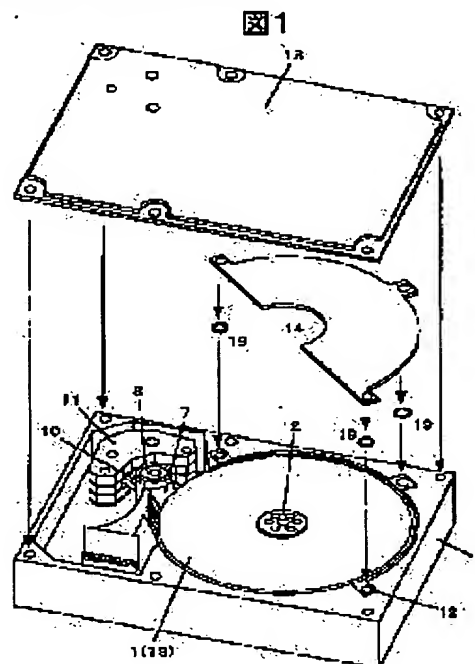
(72)Inventor : NAGAIRO MAKOTO
SEGA MASAHIKO
KONO TAKASHI

(54) MAGNETIC DISK UNIT HAVING VIBRATION REDUCTION STRUCTURE BY SQUEEZE AIR LAYER

(57)Abstract:

PROBLEM TO BE SOLVED: To install a damping plate for forming a squeeze air layer with a sufficiently narrow gap relative to a disk surface while ensuring device reliability against impact.

SOLUTION: The magnetic disk unit is provided with a spindle to mount a magnetic disk, a carriage 10 to drive a magnetic head, a coil supported by the carriage, a magnetic circuit which is supported in a housing and drives the carriage together with the coil, a housing 3 which supports the spindle, the carriage and the magnetic circuit, and a cover 18 which keeps tight sealing properties together with the housing. A damping plate 14 is placed closely to the disk surface of a top disk 13 facing the cover side and/or of a bottom disk facing the housing side and covers part of or the whole of the disk surface. The disk surface opposed to the damping plate is not used as a surface for recording data.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

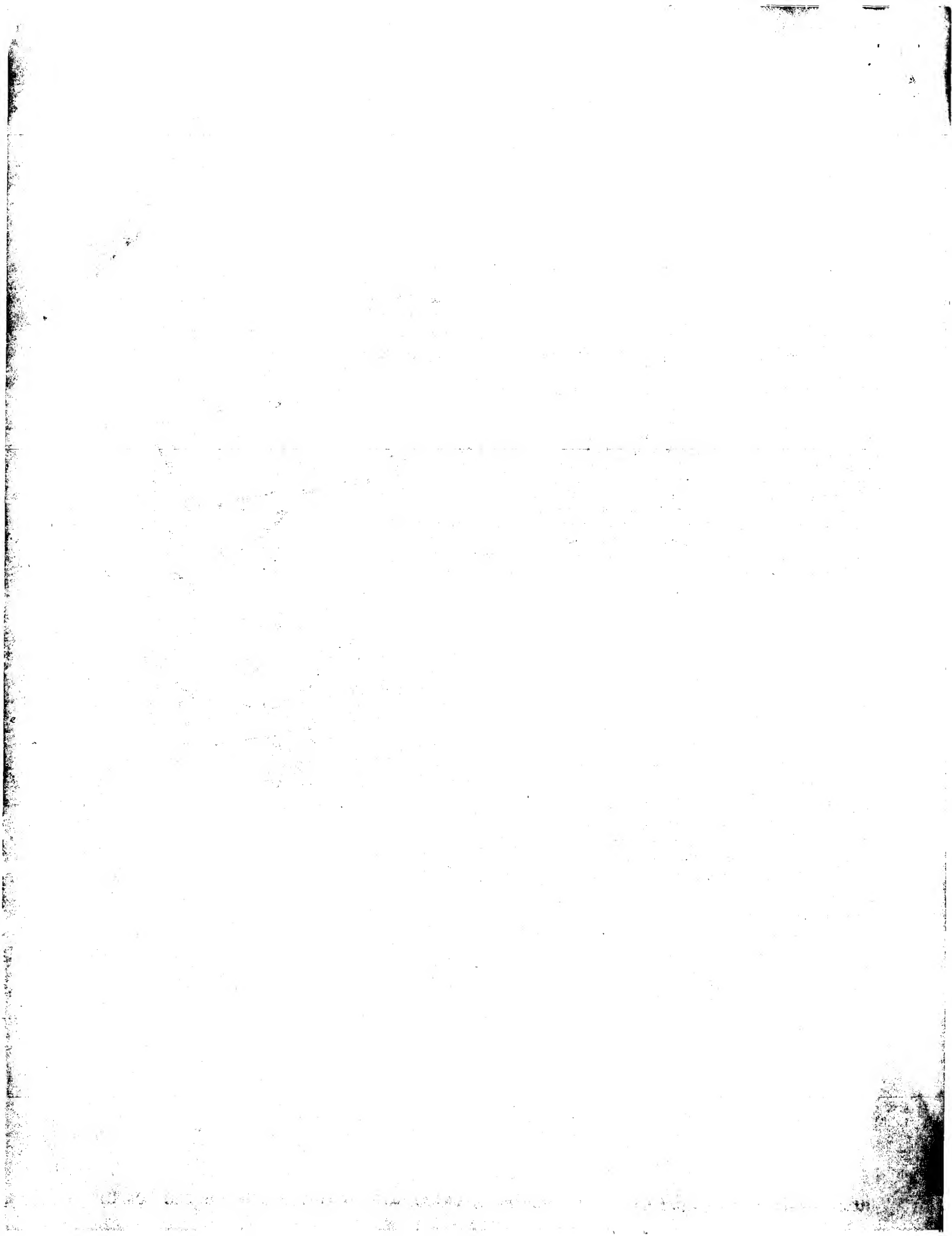
[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2000 Japan Patent Office



* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The spindle carrying a magnetic disk. Carriage which drives the magnetic head. Covering which becomes the coil supported by the aforementioned carriage, the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, the aforementioned housing, and a pair, and maintains sealing nature. It is the magnetic disk unit equipped with the above, and is characterized by approaching the disk side of the bottom disk facing the top disk [facing the aforementioned covering side], and/or housing side, and not using the disk side which installs a wrap damping board and counters the aforementioned damping board in some or all of the aforementioned disk side as a recording surface of data.

[Claim 2] The spindle carrying a magnetic disk. Carriage which drives the magnetic head. Covering which becomes the coil supported by the aforementioned carriage, the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, the aforementioned housing, and a pair, and maintains sealing nature. Are the magnetic disk unit equipped with the above, and the disk side of the bottom disk facing the top disk [facing the aforementioned covering side] and/or housing side is approached. It is characterized by using the disk side except the periphery side of the aforementioned disk side, and the periphery close-attendants side as a recording surface of data among the disk sides which install a wrap radii-like damping board and counter the aforementioned circular damping board in the periphery side of the aforementioned disk side, and a periphery close-attendants side.

[Claim 3] The spindle carrying a magnetic disk. Carriage which drives the magnetic head. Covering which becomes the coil supported by the aforementioned carriage, the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, the aforementioned housing, and a pair, and maintains sealing nature. It is the magnetic disk unit equipped with the above, and the disk side of the bottom disk facing the top disk [facing the aforementioned covering side] and/or housing side approaches, a wrap damping board installs for some or all of the aforementioned disk side, the aforementioned damping board forms a part of structure of the aforementioned covering and/or the aforementioned housing, and it carries out not using it considering the disk side which counters the aforementioned damping board as a recording surface of data as the feature.

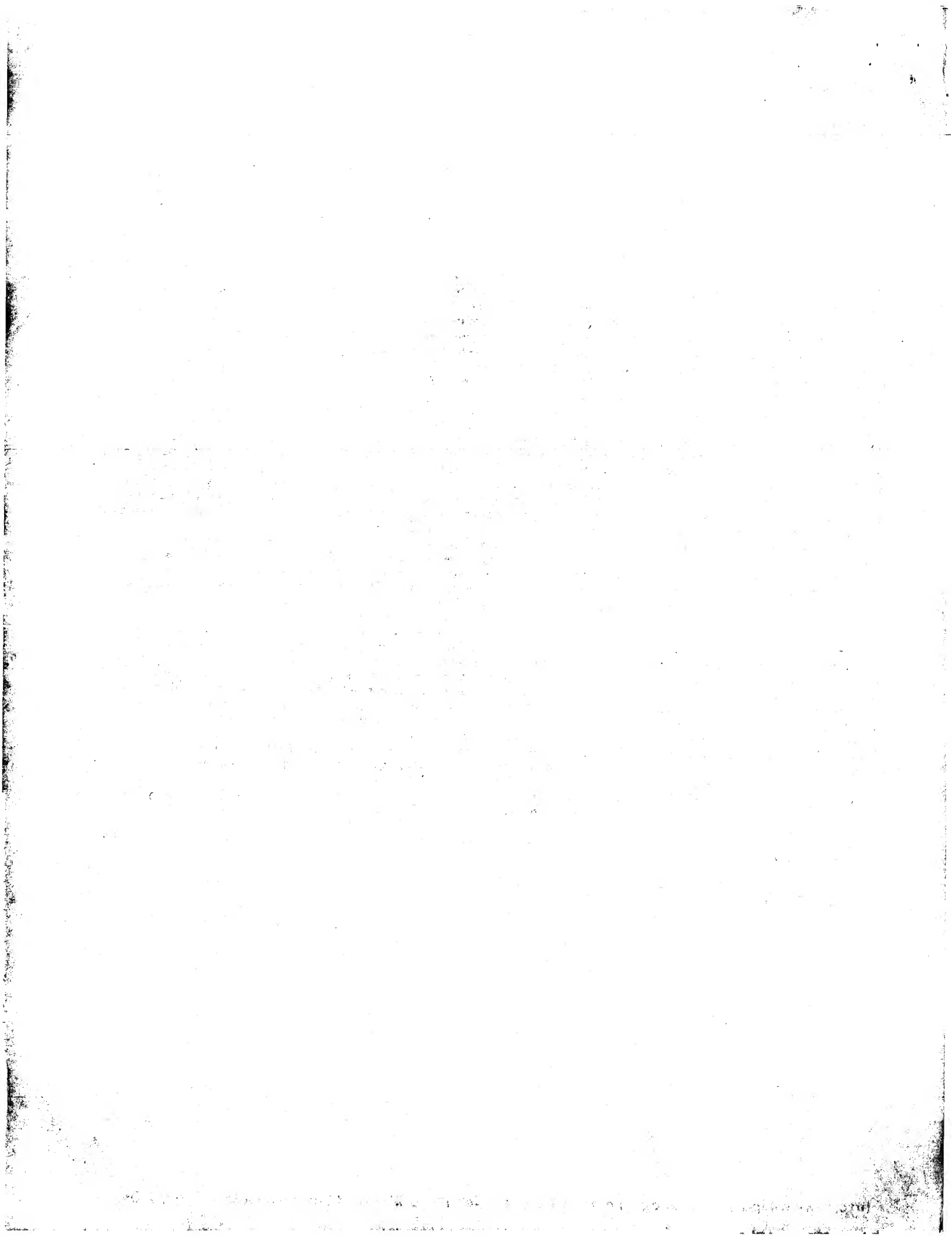
[Claim 4] the portion which installs the aforementioned damping board on the aforementioned housing in a magnetic disk unit according to claim 1 or 2 in order to raise the dimensional accuracy to the aforementioned disk side of the aforementioned damping board — deleting — processing it — the aforementioned shaving processing side of the aforementioned housing, and the aforementioned damping — the magnetic disk unit characterized by to make the sheet-metal-like parts for tuning the interval of a damping board and a disk side finely placed between wooden floors

[Claim 5] The magnetic disk unit characterized by fixing sheet metal-like parts on the aforementioned damping board in a magnetic disk unit according to claim 3 in order to tune the interval of the aforementioned damping board and the aforementioned disk side finely.

[Claim 6] The magnetic disk unit characterized by making the quality of the material of the aforementioned damping board into the nonmetal material which makes plastics an example in a magnetic disk unit given in a claim 1 or any one claim of 5.

[Claim 7] The magnetic disk unit characterized by arranging the aforementioned damping board to the aforementioned magnetic head in the position of an opposite side focusing on the axis of the aforementioned spindle in a magnetic disk unit given in a claim 1 or any one claim of 6.

[Translation done.]



* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the damping technology and impingement-protection technology of a magnetic disk unit which contained the rotating disk and the carriage supported so that the head which write information to a disk can be moved.

[0002]

[Description of the Prior Art] In the magnetic disk unit, improvement in the speed of processing speed is called for with increase of capacity, and the rotational frequency of a disk is increasing gradually. Although disk vibration called disk flutter when a disk rotates at high speed occurs in a magnetic disk unit, this vibration increases by the increase in a rotational frequency, and it has become the big factor which worsens positioning accuracy.

[0003] by preparing the shroud which surrounds a disk to the circumference by the side of the periphery of a disk, and *****(ing) distance from the end face of a disk to a shroud to a predetermined value, the difference which is the pneumatic pressure generated to both sides of a disk can be abolished, and the technology of reducing disk flutter vibration by this is indicated as indicated by JP,11-232866,A as a Prior art

[0004] by the way, the technology boil markedly the positioning accuracy demanded by much more increase in recording density, it is becoming severe in recent years, and according to aforementioned JP,11-232866,A — in addition, aiming at much more oscillating reduction has come to be called for

[0005] Furthermore, although the structure which supports a spindle by ***** by rise of the demand of a cost reduction is becoming in use in recent years, it is in the inclination for the support rigidity of the spindle body of revolution in the housing structure to fall by this. By a fall and the formation of high-speed rotation of this support rigidity, not only a disk simple substance but the whole spindle body of revolution falls, the technical problem that it becomes easy to vibrate by the normal mode of vibration of a direction arises, and it has come to be observed as a new factor which worsens positioning accuracy.

[0006] furthermore — as a Prior art — Japan Society of Mechanical Engineers news IIP '99 information and intelligence — the upper surface part which is a disk side as indicated by — precision-mechanical-equipment section lecture meeting lecture collected-works pp.29-33. "research of the flutter decreasing method with a squeeze bearing board" — a wrap — the method of installing a damping board [like] is proposed According to this, it makes it possible to reduce disk flutter vibration by the damping effect of the squeeze air film (Squeeze AirLayer) produced by narrowing the crevice between this damping board and a disk side.

[0007]

[Problem(s) to be Solved by the Invention] the damping effect of a squeeze air film is so large that the crevice between a damping board and a disk side is so narrow that the area in which the damping board is wearing the disk side is large according to the Japan Society of Mechanical Engineers news "research of the flutter decreasing method with a squeeze bearing board" of the above-mentioned conventional technology, and it is supposed especially about the crevice that a big damping effect will be acquired with setting the interval of a damping board and a disk side to dozens of micrometers or less

[0008] Moreover, to a specific disk side, when the damping effect of a squeeze air film is added, all vibration of the shaft orientations of the other disks connected with the disk, as a result the whole spindle body of revolution is considered that it can decrease. Specifically, the above-mentioned spindle body of revolution falls, and it is the normal mode of vibration of a direction or the vertical direction.

[0009] However, when this damping board is actually carried in a magnetic disk unit, possibility that a disk and a damping board will collide arises by the external shock at the time of an inoperative. If the external shock at the time of an inoperative is the worst, and assumes 250G to 300G and the deflection of the disk in that case and the installation tolerance of a damping board are taken into consideration, it needs to secure the crevice between the considerable amounts which include a margin between damping boards as a disk, and can consider the case where sufficient damping effect by the squeeze air film is not acquired.

[0010] Then, the purpose of this invention is offering a magnetic disk unit with the structure the damping board for forming a squeeze air film fully being installed by the slit to a disk side after securing the equipment reliability by the shock.

[0011]

[Means for Solving the Problem] In order to solve the aforementioned technical problem, this invention mainly adopts the following composition.

[0012] The spindle carrying a magnetic disk, and the carriage which drives the magnetic head, The coil supported by the aforementioned carriage and the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, In the magnetic disk unit equipped with housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, and covering which becomes the aforementioned housing and a pair and maintains sealing nature The magnetic disk unit which does not use the disk side which approaches the disk side of the bottom disk facing the top disk [facing the aforementioned covering side], and/or housing side, installs a wrap damping board and counters the aforementioned damping board in some or all of the aforementioned disk side as a recording surface of data.

[0013] Moreover, the spindle carrying a magnetic disk and carriage which drives the magnetic head, The coil supported by the aforementioned carriage and the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, In the magnetic disk unit equipped with housing

which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, and covering which becomes the aforementioned housing and a pair and maintains sealing nature Approach the disk side of the bottom disk facing the top disk [facing the aforementioned covering side], and/or housing side, and the periphery side of the aforementioned disk side, and a periphery close-attendants side among the disk sides which install a wrap radii-like damping board and counter the aforementioned circular damping board The magnetic disk unit which uses the disk side except the periphery side of the aforementioned disk side, and the periphery close-attendants side as a recording surface of data.

[0014] Moreover, the spindle carrying a magnetic disk and carriage which drives the magnetic head, The coil supported by the aforementioned carriage and the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, In the magnetic disk unit equipped with housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, and covering which becomes the aforementioned housing and a pair and maintains sealing nature The disk side of the bottom disk facing the top disk [facing the aforementioned covering side] and/or housing side is approached, and a wrap damping board is installed for some or all of the aforementioned disk side. the aforementioned damping board The magnetic disk unit which does not use the disk side which forms a part of structure of the aforementioned covering and/or the aforementioned housing, and counters the aforementioned damping board as a recording surface of data.

[0015]

[Embodiments of the Invention] The magnetic disk unit concerning the operation gestalt of this invention is explained below using drawing 1 - drawing 6 . Drawing 1 is a perspective diagram showing the structure with the oscillating reduction structure by the squeeze air film concerning the 1st operation gestalt of this invention of a magnetic disk unit, drawing 2 is the transverse-part cross section showing the internal structure of the magnetic disk unit of the 1st operation gestalt, and drawing 3 is the plan showing the structure of the magnetic disk unit of the 1st operation gestalt.

[0016] With reference to drawing 1 - drawing 3 , the laminating of the magnetic disk 1 is carried out to the spindle shaft 2, and the SUPINDO shaft 2 is supported by housing 3 in *****. The magnetic head 4 which records / reproduces information is carried in a slider 5, a slider 5 is supported by the magnetic-head support mechanism 6, and the support mechanism 6 is connected with the arm 7. Carriage 10 consists of an arm 7, pivot bearing 8, and a coil 9, and is rotated for an arm 7 by work of the coil 9 which became a pair, and the magnetic circuit constituted with the magnet 11 focusing on the pivot bearing 8. And these pivot bearing 8 and the magnet 11 are supported by the covering 18 which becomes housing 3 and housing 3, and a pair, and maintains sealing nature. The shaving side 12 is given to the upper surface of housing 3, and it is processed into the accurate flat surface.

[0017] Moreover, although a disk with most the bottom is called the top disk 13, the elevation of this shaving side 12 is designed so that it may become low slightly from the height of a top disk. A spacer or SIMM 19 are the metal parts of the shape of sheet metal with a thickness of 5 micrometers - 30 micrometers carried on the shaving side 12, are carrying out the configuration carried on the shaving side 12, and prepare it several kinds beforehand with thickness.

[0018] Drawing 1 will be referred to if it explains again, housing 3 Generally, since it was not processed precisely, the height and flatness of the front face In the example of drawing 1 , a hollow is established in three places, the height and flatness of the hollow are deleted precisely, are processed, a spacer or SIMM lays the sheet metal-like metal parts of thickness in the processed hollow suitably, and the damping board 14 is installed in it for the sheet metal parts concerned as datum level. In the example of drawing 1 , a tapped hole is prepared in the shaving side 12 and the damping board 14, and it has structure which ****s, stops and carries out the damping board 14.

[0019] the front face of the top disk 13, and the elevation of the shaving side 12 -- a small gage -- measuring -- the difference of elevation -- responding -- a spacer or SIMM 19 -- one sheet -- or two or more sheets are chosen and it arranges on the shaving side 12 And the damping board 14 is installed in the flat surface adjusted to the position higher about 50 micrometers than the top disk 13 by the spacer or SIMM 19 by the screw stop. Thereby, a disk side and the crevice between the damping boards 14 can be set to 50**5 micrometers.

[0020] According to the plan of the magnetic disk unit of this operation gestalt shown in drawing 3 , the top disk 13 and the damping board 14 It is as narrow as about 50 micrometers enough, and since the large configuration of a damping board is also taken, it will be in a wrap state about a half about the disk side of the top disk 13. The big damping effect by the squeeze air film can be acquired (it is the effect which suppresses vibration of a disk by the squeezed pneumatic pressure which was inserted into the topmost disk and the damping board formed on the disk concerned). In the easy experiment, when vibration of a disk is measured under the same conditions, it is checked that disk flutter vibration disappears mostly.

[0021] Here, the primary diameter paragraph mode which is the mode in which an amplitude is the largest, in each mode of disk flutter vibration is the mode in which a disk lenticulates so that the diameter of a disk may be flapped as a paragraph. That is, a certain diameter (it is the diameter of a housing longitudinal direction at the example of drawing 1) of a disk is used as a paragraph at a certain time, and vibration to which the edge of the straight line which crosses a certain diameter and right angle concerned serves as a belly occurs (vibration used as the belly for the edge of the diameter of the direction of a housing short hand to lenticulate most in the example of drawing 1 occurs). And since the diameter used as a paragraph is shifted every moment, vibration to which the periphery edge of a disk lenticulates most after all generates it. Then, the effect of interlocking effectively vibration in the position of the head 5 of an opposite side, and reducing it by reducing compulsorily disk flutter vibration in the position of the damping board 14 by the squeeze air barrier effect can be given like drawing 3 by arranging the damping board 14 to an opposite side in a head 5 to the spindle shaft 2.

[0022] Next, the preventive measure to the shock which joins a magnetic disk unit is explained. The magnetic disk unit is using the 3 inches glass disk, and the spindle shaft 2 has support-at-one-end *****. It was computed, when the simulation when 300G (sine wave of 2ms of width of face) which are the shock of the permission maximum are added at the time of quiescence was performed in consideration of these conditions and the amount of relative displacements of the top disk 13 and housing 3 was set to about about 130 micrometers at the maximum. Consequently, although it is assumed that the top disk 13 whose mutual interval is 50 micrometers, and the damping board 14 contact and an injury may occur in a disk side, contacting may think that it is limited to the periphery side of the upper surface of the top disk 13, or its near (since the periphery side is free to the disk center being fixed). Here, the upper surface of the top disk 13 is a dummy disk side, and is not used for record of data. Therefore, though the top disk 13 and the damping board 14 should contact, fatal problems, such as destruction of data, are avoidable with the shock at the time of quiescence.

[0023] Moreover, the damping board 14 makes plastics the quality of the material, and even when the top disk 13 which the damping board 14 turns into from a glass disk temporarily by the shock is contacted, it has the quality-of-the-material structure

of preventing doing an injury to a disk side.

[0024] Although the damping board 14 has covered the abbreviation half of the disk side of a top disk by the above explanation, you may cover some or all of a disk side.

[0025] Next, the magnetic disk unit concerning the 2nd operation gestalt of this invention is shown in drawing 4. Here, it is the structure which shortened the radial size of the damping board 14, considered as the radii configuration compared with the 1st operation gestalt, and has arranged the magnetic head 4, the slider 5, the support mechanism 6, and the arm 7 also on the top disk 13. Since it is only the periphery side of the top disk 13, and its near which are being used as a squeeze side (field currently worn by the damping board 14), and wrap area decreases the disk side of the top disk 13 and it is a disk periphery side and near as it mentioned above with [at the time of a quiescence shock] the disk blemish although the damping effect of a squeeze air film will decrease, the inner circumference side of a disk becomes possible [using it as a data surface]. The fall of the storage capacity produced by this in order to use a disk side as a squeeze side is suppliable.

[0026] Next, the magnetic disk unit concerning the 3rd operation form of this invention is shown in drawing 5. Here, it is the structure which removed the magnetic head 4 and the arm 7 grade of a bottom disk side of the bottom disk 16 which install the damping board 15 (housing is the thing of another object) for housing bottoms in the bottom of the housing 3 by which shaving processing was carried out in addition to the 1st operation form, and are in the bottom side of housing 3 (the prevention with a bottom disk blemish at the time of a quiescence shock sake). Under the present circumstances, the difference of elevation of the disk side of the damping board 15 for housing bottoms and the bottom disk 16 measures the elevation of the flange face 17 of a hub, and the bottom of housing 3 with a micro gage, and adjusts it by inserting a spacer or SIMM like the 1st operation form. With this structure, since it will be used as a squeeze side also about the bottom disk 16 in addition to the top disk 13, the damping effect by the squeeze air film can be made into double precision. Moreover, you may be only the damping board 15 for housing bottoms.

[0027] Next, the magnetic disk unit concerning the 4th operation form of this invention is shown in drawing 6. A part of bottom of housing 3 is made into the structure which rose to the bottom disk 16, and the disk side of the bottom disk 16 and the flat surface which approached are made to form here. Moreover, covering 18 is used as a shaving article, the part by the side of the interior is made into the structure which rose to the top disk 13, and the disk side of the top disk 13 and the flat surface which approached are made to form. Moreover, the housing side of the bottom disk 16 considers as a dummy disk side the covering side of the top disk 13, and the magnetic head 4 and arm 7 grade do not arrange.

[0028] Under the present circumstances, adjustment of the crevice between housing 3 and covering 18, and a disk side is performed by sticking a spacer or SIMM on the squeeze side of housing 3 and covering 18 by which shaving processing was carried out, respectively, not a size like the sign 19 which shows the spacer in this case, or the size of SIMM to drawing 1 but housing and the climax section of covering, and abbreviation — it considers as the same size With this structure, since the damping effect by the squeeze air film can be realized without using the damping board 14 and the damping board 15 for housing bottoms, part mark can be reduced.

[0029] As explained above, the feature of the operation form of this invention is making some or all of a disk side facing the damping board into a dummy disk side, and considering as the method which is not used as a recording surface of data, and was made into the structure which problems, such as destruction of data, do not produce even if it should collide.

[0030] moreover, the part in which the damping board on housing is installed in order to raise the precision of the crevice between a damping board and a disk side — deleting — processing — giving — moreover, housing and damping — height tolerance of a disk side and a damping board installation side was made into the structure which inserts the spacer or SIMM (thin-gauge-structure object) of an amendment sake at the wooden floor

[0031]

[Effect of the Invention] According to this invention, disk flutter vibration and spindle vibration can be reduced sharply, and a high-speed mass magnetic disk unit can be offered.

[0032] Moreover, even when a quiescence shock joins a magnetic disk unit, destruction of the data recorded on the disk can be prevented from being generated.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the damping technology and impingement-protection technology of a magnetic disk unit which contained the rotating disk and the carriage supported so that the head which write information to a disk can be moved.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] In the magnetic disk unit, improvement in the speed of processing speed is called for with increase of capacity, and the rotational frequency of a disk is increasing gradually. Although disk vibration called disk flutter when a disk rotates at high speed occurs in a magnetic disk unit, this vibration increases by the increase in a rotational frequency, and it has become the big factor which worsens positioning accuracy.

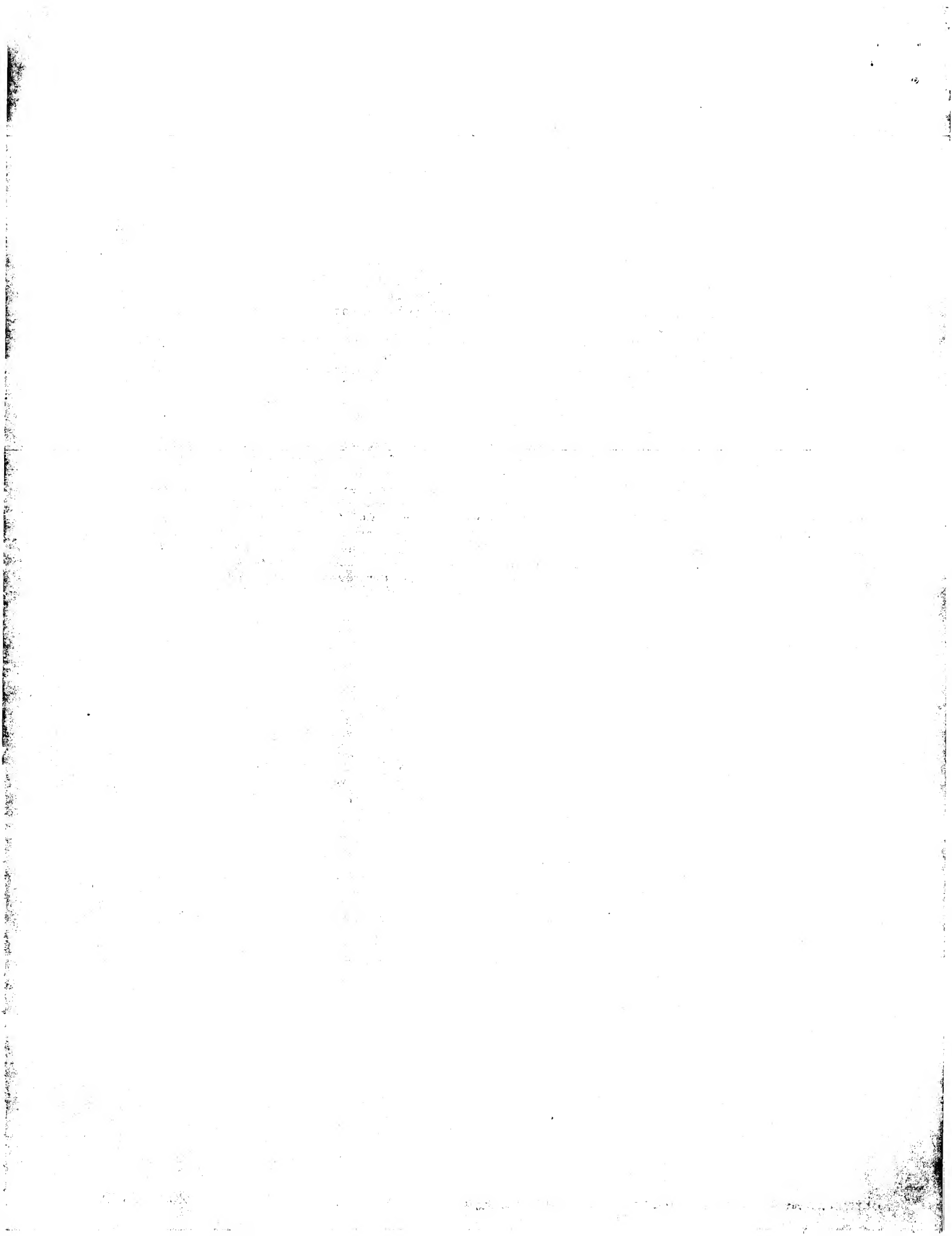
[0003] by preparing the shroud which surrounds a disk to the circumference by the side of the periphery of a disk, and ***** (ing) distance from the end face of a disk to a shroud to a predetermined value, the difference which is the pneumatic pressure generated to both sides of a disk can be abolished, and the technology of reducing disk flutter vibration by this is indicated as indicated by JP,11-232866,A as a Prior art

[0004] by the way, the technology boil markedly the positioning accuracy demanded by much more increase in recording density, it is becoming severe in recent years, and according to aforementioned JP,11-232866,A — in addition, aiming at much more oscillating reduction has come to be called for

[0005] Furthermore, although the structure which supports a spindle by ***** by rise of the demand of a cost reduction is becoming in use in recent years, it is in the inclination for the support rigidity of the spindle body of revolution in the housing structure to fall by this. By a fall and the formation of high-speed rotation of this support rigidity, not only a disk simple substance but the whole spindle body of revolution falls, the technical problem that it becomes easy to vibrate by the normal mode of vibration of a direction arises, and it has come to be observed as a new factor which worsens positioning accuracy.

[0006] furthermore — as a Prior art — Japan Society of Mechanical Engineers news IIP '99 information and intelligence — the upper surface part which is a disk side as indicated by — precision-mechanical-equipment section lecture meeting lecture collected-works pp.29-33. "research of the flutter decreasing method with a squeeze bearing board" — a wrap — the method of installing a damping board [like] is proposed According to this, it makes it possible to reduce disk flutter vibration by the damping effect of the squeeze air film (Squeeze AirLayer) produced by narrowing the crevice between this damping board and a disk side.

[Translation done.]



* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, disk flutter vibration and spindle vibration can be reduced sharply, and a high-speed mass magnetic disk unit can be offered.

[0032] Moreover, even when a quiescence shock joins a magnetic disk unit, destruction of the data recorded on the disk can be prevented from being generated.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] the damping effect of a squeeze air film is so large that the crevice between a damping board and a disk side is so narrow that the area in which the damping board is wearing the disk side is large according to the Japan Society of Mechanical Engineers news "research of the flutter decreasing method with a squeeze bearing board" of the above-mentioned conventional technology, and it is supposed especially about the crevice that a big damping effect will be acquired with setting the interval of a damping board and a disk side to dozens of micrometers or less

[0008] Moreover, to a specific disk side, when the damping effect of a squeeze air film is added, all vibration of the shaft orientations of the other disks connected with the disk, as a result the whole spindle body of revolution is considered that it can decrease. Specifically, the above-mentioned spindle body of revolution falls, and it is the normal mode of vibration of a direction or the vertical direction.

[0009] However, when this damping board is actually carried in a magnetic disk unit, possibility that a disk and a damping board will collide arises by the external shock at the time of an inoperative. If the external shock at the time of an inoperative is the worst, and assumes 250G to 300G and the deflection of the disk in that case and the installation tolerance of a damping board are taken into consideration, it needs to secure the crevice between the considerable amounts which include a margin between damping boards as a disk, and can consider the case where sufficient damping effect by the squeeze air film is not acquired.

[0010] Then, the purpose of this invention is offering a magnetic disk unit with the structure the damping board for forming a squeeze air film fully being installed by the slit to a disk side after securing the equipment reliability by the shock.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] In order to solve the aforementioned technical problem, this invention mainly adopts the following composition.

[0012] The spindle carrying a magnetic disk, and the carriage which drives the magnetic head, The coil supported by the aforementioned carriage and the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, In the magnetic disk unit equipped with housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, and covering which becomes the aforementioned housing and a pair and maintains sealing nature The magnetic disk unit which does not use the disk side which approaches the disk side of the bottom disk facing the top disk [facing the aforementioned covering side], and/or housing side, installs a wrap damping board and counters the aforementioned damping board in some or all of the aforementioned disk side as a recording surface of data.

[0013] Moreover, the spindle carrying a magnetic disk and carriage which drives the magnetic head, The coil supported by the aforementioned carriage and the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, In the magnetic disk unit equipped with housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, and covering which becomes the aforementioned housing and a pair and maintains sealing nature Approach the disk side of the bottom disk facing the top disk [facing the aforementioned covering side], and/or housing side, and the periphery side of the aforementioned disk side, and a periphery close-attendants side among the disk sides which install a wrap radii-like damping board and counter the aforementioned circular damping board The magnetic disk unit which uses the disk side except the periphery side of the aforementioned disk side, and the periphery close-attendants side as a recording surface of data.

[0014] Moreover, the spindle carrying a magnetic disk and carriage which drives the magnetic head, The coil supported by the aforementioned carriage and the magnetic circuit supported by the aforementioned housing which it becomes [housing] the aforementioned coil and a pair and makes the aforementioned carriage drive, In the magnetic disk unit equipped with housing which supports the aforementioned spindle, the aforementioned carriage, and the aforementioned magnetic circuit, and covering which becomes the aforementioned housing and a pair and maintains sealing nature The disk side of the bottom disk facing the top disk [facing the aforementioned covering side] and/or housing side is approached, and a wrap damping board is installed for some or all of the aforementioned disk side, the aforementioned damping board The magnetic disk unit which does not use the disk side which forms a part of structure of the aforementioned covering and/or the aforementioned housing, and counters the aforementioned damping board as a recording surface of data.

[0015] [Embodiments of the Invention] The magnetic disk unit concerning the operation gestalt of this invention is explained below using drawing 1 - drawing 6 . Drawing 1 is a perspective diagram showing the structure with the oscillating reduction structure by the squeeze air film concerning the 1st operation gestalt of this invention of a magnetic disk unit, drawing 2 is the transverse-part cross section showing the internal structure of the magnetic disk unit of the 1st operation gestalt, and drawing 3 is the plan showing the structure of the magnetic disk unit of the 1st operation gestalt.

[0016] With reference to drawing 1 - drawing 3 , the laminating of the magnetic disk 1 is carried out to the spindle shaft 2, and the SUPINDO shaft 2 is supported by housing 3 in *****. The magnetic head 4 which records / reproduces information is carried in a slider 5, a slider 5 is supported by the magnetic-head support mechanism 6, and the support mechanism 6 is connected with the arm 7. Carriage 10 consists of an arm 7, pivot bearing 8, and a coil 9, and is rotated for an arm 7 by work of the coil 9 which became a pair, and the magnetic circuit constituted with the magnet 11 focusing on the pivot bearing 8. And these pivot bearing 8 and the magnet 11 are supported by the covering 18 which becomes housing 3 and housing 3, and a pair, and maintains sealing nature. The shaving side 12 is given to the upper surface of housing 3, and it is processed into the accurate flat surface.

[0017] Moreover, although a disk with most the bottom is called the top disk 13, the elevation of this shaving side 12 is designed so that it may become low slightly from the height of a top disk. A spacer or SIMM 19 are the metal parts of the shape of sheet metal with a thickness of 5 micrometers - 30 micrometers carried on the shaving side 12, are carrying out the configuration carried on the shaving side 12, and prepare it several kinds beforehand with thickness.

[0018] Drawing 1 will be referred to if it explains again, housing 3 Generally, since it was not processed precisely, the height and flatness of the front face In the example of drawing 1 , a hollow is established in three places, the height and flatness of the hollow are deleted precisely, are processed, a spacer or SIMM lays the sheet metal-like metal parts of thickness in the processed hollow suitably, and the damping board 14 is installed in it for the sheet metal parts concerned as datum level. In the example of drawing 1 , a tapped hole is prepared in the shaving side 12 and the damping board 14, and it has structure which ****s, stops and carries out the damping board 14.

[0019] the front face of the top disk 13, and the elevation of the shaving side 12 — a small gage — measuring — the difference of elevation — responding — a spacer or SIMM 19 — one sheet — or two or more sheets are chosen and it arranges on the shaving side 12 And the damping board 14 is installed in the flat surface adjusted to the position higher about 50 micrometers than the top disk 13 by the spacer or SIMM 19 by the screw stop. Thereby, a disk side and the crevice between the damping boards 14 can be set to 50**5 micrometers.

[0020] According to the plan of the magnetic disk unit of this operation form shown in drawing 3 , the top disk 13 and the damping board 14 It is as narrow as about 50 micrometers enough, and since the large configuration of a damping board is also

taken, it will be in a wrap state about a half about the disk side of the top disk 13. The big damping effect by the squeeze air film can be acquired (it is the effect which suppresses vibration of a disk by the squeezed pneumatic pressure which was inserted into the topmost disk and the damping board formed on the disk concerned). In the easy experiment, when vibration of a disk is measured under the same conditions, it is checked that disk flutter vibration disappears mostly.

[0021] Here, the primary diameter paragraph mode which is the mode in which an amplitude is the largest, in each mode of disk flutter vibration is the mode in which a disk lenticulates so that the diameter of a disk may be flapped as a paragraph. That is, a certain diameter (it is the diameter of a housing longitudinal direction at the example of drawing 1) of a disk is used as a paragraph at a certain time, and vibration to which the edge of the straight line which crosses a certain diameter and right angle concerned serves as a belly occurs (vibration used as the belly for the edge of the diameter of the direction of a housing short hand to lenticulate most in the example of drawing 1 occurs). And since the diameter used as a paragraph is shifted every moment, vibration to which the periphery edge of a disk lenticulates most after all generates it. Then, the effect of interlocking effectively vibration in the position of the head 5 of an opposite side, and reducing it by reducing compulsorily disk flutter vibration in the position of the damping board 14 by the squeeze air barrier effect can be given like drawing 3 by arranging the damping board 14 to an opposite side in a head 5 to the spindle shaft 2.

[0022] Next, the preventive measure to the shock which joins a magnetic disk unit is explained. The magnetic disk unit is using the 3 inches glass disk, and the spindle shaft 2 has support-at-one-end *****. It was computed, when the simulation when 300G (sine wave of 2ms of width of face) which are the shock of the permission maximum are added at the time of quiescence was performed in consideration of these conditions and the amount of relative displacements of the top disk 13 and housing 3 was set to about about 130 micrometers at the maximum. Consequently, although it is assumed that the top disk 13 whose mutual interval is 50 micrometers, and the damping board 14 contact and damage may occur in a disk side, contacting may think that it is limited to the periphery side of the upper surface of the top disk 13, or its near (since the periphery side is free to the disk center being fixed). Here, the upper surface of the top disk 13 is a dummy disk side, and is not used for record of data. Therefore, though the top disk 13 and the damping board 14 should contact, fatal problems, such as destruction of data, are avoidable with the shock at the time of quiescence.

[0023] Moreover, the damping board 14 makes plastics the quality of the material, and even when the top disk 13 which the damping board 14 turns into from a glass disk temporarily by the shock is contacted, it has the quality-of-the-material structure of preventing doing damage to a disk side.

[0024] Although the damping board 14 has covered the abbreviation half of the disk side of a top disk by the above explanation, you may cover some or all of a disk side.

[0025] Next, the magnetic disk unit concerning the 2nd operation form of this invention is shown in drawing 4. Here, it is the structure which shortened the radial size of the damping board 14, considered as the radii configuration compared with the 1st operation form, and has arranged the magnetic head 4, the slider 5, the support mechanism 6, and the arm 7 also on the top disk 13. Since it is only the periphery side of the top disk 13, and its near which are being used as a squeeze side (field currently worn by the damping board 14), and wrap area decreases the disk side of the top disk 13 and it is a disk periphery side and near as it mentioned above with [at the time of a quiescence shock] the disk blemish although the damping effect of a squeeze air film decrease, the inner circumference side of a disk becomes possible [using it as a data surface]. The fall of the storage capacity produced by this in order to use a disk side as a squeeze side is suppliable.

[0026] Next, the magnetic disk unit concerning the 3rd operation form of this invention is shown in drawing 5. Here, it is the structure which removed the magnetic head 4 and the arm 7 grade of a bottom disk side of the bottom disk 16 which install the damping board 15 (housing is the thing of another object) for housing bottoms in the bottom of the housing 3 by which shaving processing was carried out in addition to the 1st operation form, and are in the bottom side of housing 3 (the prevention with a bottom disk blemish at the time of a quiescence shock sake). Under the present circumstances, the difference of elevation of the disk side of the damping board 15 for housing bottoms and the bottom disk 16 measures the elevation of the flange face 17 of a hub, and the bottom of housing 3 with a micro gage, and adjusts it by inserting a spacer or SIMM like the 1st operation form. With this structure, since it will be used as a squeeze side also about the bottom disk 16 in addition to the top disk 13, the damping effect by the squeeze air film can be made into double precision. Moreover, you may be only the damping board 15 for housing bottoms.

[0027] Next, the magnetic disk unit concerning the 4th operation form of this invention is shown in drawing 6. A part of bottom of housing 3 is made into the structure which rose to the bottom disk 16, and the disk side of the bottom disk 16 and the flat surface which approached are made to form here. Moreover, covering 18 is used as a shaving article, the part by the side of the interior is made into the structure which rose to the top disk 13, and the disk side of the top disk 13 and the flat surface which approached are made to form. Moreover, the housing side of the bottom disk 16 considers as a dummy disk side the covering side of the top disk 13, and the magnetic head 4 and arm 7 grade do not arrange.

[0028] Under the present circumstances, adjustment of the crevice between housing 3 and covering 18, and a disk side is performed by sticking a spacer or SIMM on the squeeze side of housing 3 and covering 18 by which shaving processing was carried out, respectively. not a size like the sign 19 which shows the spacer in this case, or the size of SIMM to drawing 1 but housing and the climax section of covering, and abbreviation -- it considers as the same size With this structure, since the damping effect by the squeeze air film can be realized without using the damping board 14 and the damping board 15 for housing bottoms, part mark can be reduced.

[0029] As explained above, the feature of the operation gestalt of this invention is making some or all of a disk side facing the damping board into a dummy disk side, and considering as the method which is not used as a recording surface of data, and was made into the structure which problems, such as destruction of data, do not produce even if it should collide.

[0030] moreover, the part in which the damping board on housing is installed in order to raise the precision of the crevice between a damping board and a disk side -- deleting -- processing -- giving -- moreover, housing and damping -- height tolerance of a disk side and a damping board installation side was made into the structure which inserts the spacer or SIMM (thin-gauge-structure object) of an amendment sake at the wooden floor

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective diagram showing the structure with the oscillating reduction structure by the squeeze air film concerning the 1st operation gestalt of this invention of a magnetic disk unit.

[Drawing 2] It is the cross section showing the internal structure of a magnetic disk unit with the oscillating reduction structure by the squeeze air film concerning the 1st operation gestalt of this invention.

[Drawing 3] It is the plan showing the structure with the oscillating reduction structure by the squeeze air film concerning the 1st operation gestalt of this invention of a magnetic disk unit.

[Drawing 4] It is the plan showing the structure with the oscillating reduction structure by the squeeze air film concerning the 2nd operation gestalt of this invention of a magnetic disk unit.

[Drawing 5] It is the cross section showing the structure with the oscillating reduction structure by the squeeze air film concerning the 3rd operation gestalt of this invention of a magnetic disk unit.

[Drawing 6] It is the cross section showing the structure with the oscillating reduction structure by the squeeze air film concerning the 4th operation gestalt of this invention of a magnetic disk unit.

[Description of Notations]

- 1 Magnetic Disk
- 2 Spindle Shaft
- 3 Housing
- 4 Magnetic Head
- 5 Slider
- 6 Magnetic-Head Support Mechanism
- 7 Arm
- 8 Pivot Bearing
- 9 Coil
- 10 Carriage
- 11 Magnet
- 12 Shaving Side
- 13 Top Disk
- 14 Damping Board
- 15 Damping Board for Housing Bottoms
- 16 Bottom Disk
- 17 Flange Face of Hub
- 18 Covering
- 19 Spacer or SIMM (Sheet Metal-like Metal Parts)

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

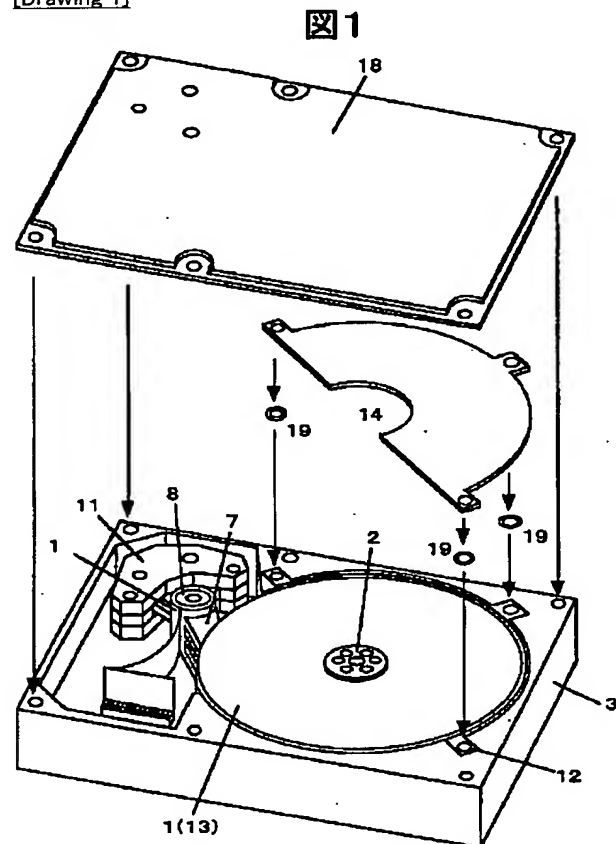
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

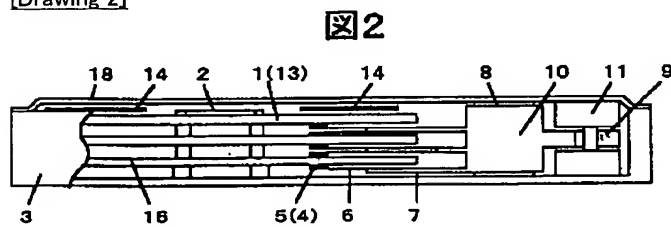
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

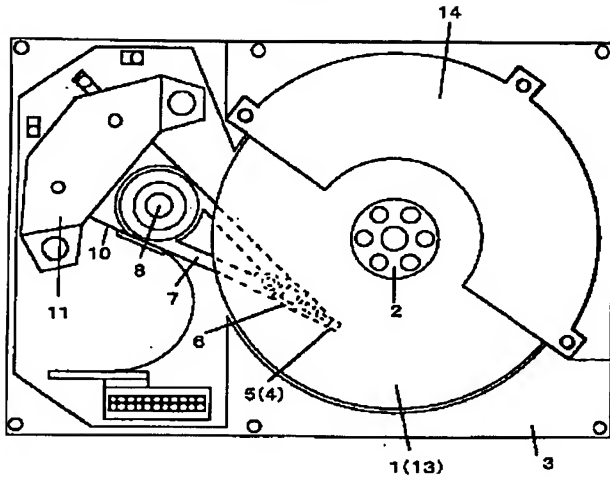


[Drawing 2]



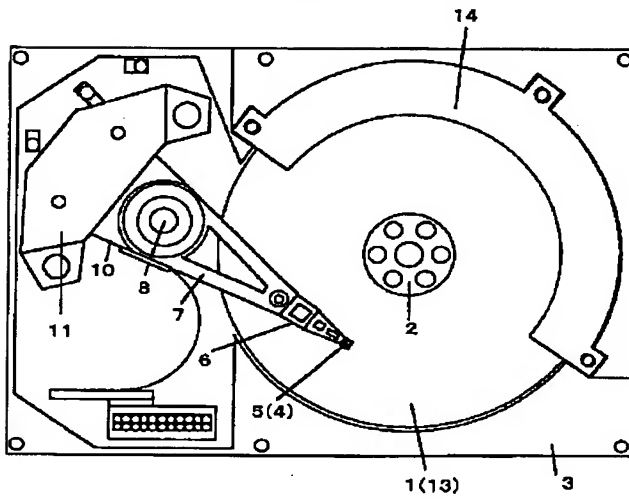
[Drawing 3]

図3



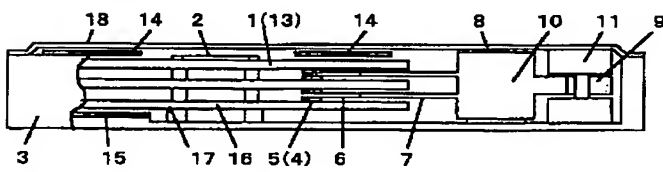
[Drawing 4]

図4



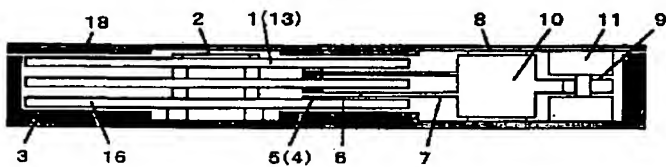
[Drawing 5]

図5



[Drawing 6]

図6



[Translation done.]